

JAPANESE

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CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF  
THE INVENTION TECHNICAL PROBLEM MEANS EXAMPLE

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[Translation done.]

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the substrate for lamp reflectors which consists of a thermoplastic resin composition which are a light weight and high heat resistance, and was excellent in dimensional stability.

[0002]

[Description of the Prior Art]On the various lamps used for indoor and exterior illumination. Although a reflector is attached in many cases for that improvement in illumination, thermoplastic resin compositions strengthened with glass fiber, an inorganic filler, etc., such as nylon 6 resin and polybutyrene terephthalate resin, have mainly been conventionally used for this substrate for reflectors. On the other hand, although the thermosetting resin strengthened with glass fiber etc. is also adopted, from a viewpoint of molding workability, the direction of the thermoplastic resin composition is excellent.

[0003]Such a substrate for reflectors made of resin is the characteristic also with important performance relevant to the aluminum vacuum evaporation given in order to raise the reflectance of light, although heat resistance and a strength property are required from the operating environment and purpose of use. However, in order to reconcile heat resistance and intensity, a lot of glass fibers or inorganic fillers needed to be filled up with the substrate made of resin used conventionally, and there was a fault of becoming heavy. If it applies to the substrate for lamp reflectors used near the light source for the orientation of the reinforcement accompanying shaping when fibrous reinforcing materials, such as glass fiber, are used, as a result of anisotropy's arising in thermal expansion, there was also a problem that a vacuum evaporation film exfoliated easily.

[0004]

[Problem(s) to be Solved by the Invention]This invention solves the above-mentioned problem, are a light weight and high heat resistance, and provides the substrate for lamp reflectors with which the anisotropy of the dimensional change at the time of heating consists of few thermoplastic resin compositions.

[0005]

[Means for Solving the Problem] This invention persons result in this invention, as a result of repeating examination wholeheartedly, in order to solve an aforementioned problem. That is, the gist of this invention is as follows.

(1) Specific gravity Load deflection temperature in 1.2 or less and 1.8MPa. Substrate for lamp reflectors which consists of a thermoplastic resin composition with which it is not less than 120 \*\*, and a coefficient of linear expansion is satisfied of following formula \*\*.

$E_{TD}/E_{MD} \leq 1.5^{**}$  -- here,  $E_{MD}$  expresses a coefficient of linear expansion of a flow direction of resin, and  $E_{TD}$  expresses a coefficient of linear expansion of a flow and rectangular directions.

(2) A substrate for lamp reflectors given in above-mentioned (1), wherein silicate layers of a sheet silicate are the thermoplastic resin compositions distributed with a molecular level in thermoplastics.

[0006]

[Embodiment of the Invention] Hereafter, this invention is explained in detail.

[0007] The thermoplastic resin composition in this invention is specific gravity. The load deflection temperature in 1.2 or less and 1.8MPa. It is not less than 120 \*\*, and it is required for a coefficient of linear expansion to satisfy said formula \*\*. Namely, the substrate for lamp reflectors of this invention, While it is lightweight, heat resistance is also required, and in order for the aluminum vacuum evaporation film given especially for the purpose of improvement in reflectance not to exfoliate from the base material surface for lamp reflectors at the time of long-term use, it is required for the coefficient of linear expansion of this thermoplastic resin composition to fill said formula \*\*. If the value of formula \*\* exceeds 1.5, an aluminum vacuum evaporation film will come to exfoliate easily in process of heating repeated at the time of actual use, and cooling. The curvature of mold goods and modification also become large.

[0008] As the above-mentioned thermoplastic resin composition, that by which the silicate layers of the sheet silicate were distributed with the molecular level can use it conveniently into thermoplastics. Silicate layers are basic units which constitute a sheet silicate here, and it is obtained by carrying out cleavage of the sheet silicate. When a sheet silicate distributes distributing with a molecular level in a thermoplastics matrix, the state where each is maintaining not less than 20Å interlaminar distance is said. interlaminar distance referring to the distance between the center of gravity of said silicate layers, and distributing, The state of existing at random in parallel [ one sheet one sheet or the average lap of said silicate layers / the multilayer thing of five or less layers ] without the not less than 50% forming a lump into a thermoplastics matrix where parallel and random are intermingling is said. Wide angle X diffraction measurement can be performed about the pellet of a thermoplastic resin composition, and, specifically, it can check from that the peak resulting from the thickness direction of a sheet silicate has disappeared, or transmission electron microscope observation of the ultrathin section obtained from the pellet.

[0009] As thermoplastics, especially if it is resin which can be distributed with a molecular level, are not limited, but the silicate layers of the above-mentioned sheet silicate. Polyester resin, polyacetal resin, etc. which are represented by polyamide resin, polybutylene terephthalate, polyethylene terephthalate, etc. are preferred, and the polyamide resin which balance with physical properties and cost was able to take is more preferred. Specifically PORIKA pro amide (nylon 6), polytetra ethylene adipamide (Nylon 46), Homopolymers, these copolymers, or these mixtures of polyhexamethylene adipamide (Nylon 66), etc. are mentioned, and nylon 6, and the homopolymers or these copolymers of Nylon 66 are especially preferred.

[0010] Although the relative viscosity in particular of thermoplastics is not limited, when polyamide resin is used, for example, It is preferred that it is in the range of 1.5-5.0 with the value calculated on with the temperature of 25 \*\* and a concentration of 1 g/dl

conditions, using 96-% of the weight concentrated sulfuric acid as a solvent, and especially the thing of the range of 2.0-3.5 is preferred. This relative viscosity. In less than 1.5 thing, the mechanical strength at the time of processing it into the substrate for lamp reflectors falls. On the other hand, in that in which this relative viscosity exceeds 5.0, a moldability falls remarkably. When polyester resin and polyacetal resin are used, it is the same as that of polyamide resin except having used phenol/tetrachloroethane (weight ratios 1/1) as a solvent.

[0011]As the sheet silicate in this invention -- a smectite group (for example, montmorillonite.) A BANDE light, saponite, hectorite, a saunonite, a vermiculite group. (for example, a vermiculite) and a mica group (for example, fluoro mica and white mica.) Palagonite phlogopite, black mica, a REPIDO night, a brittle mica group. Although hydrous inosilicate system minerals, such as (for example, margarite, a klint night and Annan Daito), a chlorite group (for example, a DOMBA site, SUDOAITO, KUKKEAITO, KURINOKUROA, a game fowl night, Nima Ito), and sepiolite, etc. are mentioned, In these, a swelling fluoride mica system mineral (what replaced the hydroxyl group of mica with fluoride, and henceforth "fluoride mica"), or montmorillonite is preferred in respect of the dispersibility of the silicate layers in thermoplastics.

[0012]Said fluoride mica is shown by the following formula and can be compounded easily.

$\alpha\text{Mg}(\text{F})_2 \cdot \beta\text{Mg}(\text{F})_2 \cdot \gamma\text{SiO}_2$  (M expresses sodium or lithium among a formula, and  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $a$ , and  $b$  express calculation respectively, and are  $0.1 \leq \alpha \leq 2$ ,  $2 \leq \beta \leq 3.5$ ,  $3 \leq \gamma \leq 4$ ,  $0 \leq a \leq 1$ ,  $0 \leq b \leq 1$ , and  $a+b=1$ .)

[0013]The above-mentioned montmorillonite can be obtained by being shown by the following formula and refining what is produced naturally.

$\text{M}_x\text{Si}_4(\text{aluminum}_{2-2x}\text{Mg}_x)\text{O}_{10}(\text{OH})_2 \cdot n\text{H}_2\text{O}$  (among a formula, M expresses the cation of sodium and is within the limits of  $0.25 \leq a \leq 0.6$ .) Since the number of the water molecules combined with the ionic exchange nature cation between layers might change according to conditions, such as cationic species and humidity, it was expressed with  $n\text{H}_2\text{O}$  in the formula.

[0014]The rate of the sheet silicate blended with thermoplastics, Specific gravity The load deflection temperature in 1.8MPa or less by 1.2. above 120 \*\*. And if a coefficient of linear expansion can make it the thermoplastic resin composition with which it is satisfied of said formula \*\*, limitation in particular will not be carried out, but it is usually preferred to consider it as one to 10 weight section to thermoplastics 100 weight section. These loadings cannot reveal the improved effect of heat resistance, an elastic modulus, and dimensional stability easily in less than one weight section. On the other hand, if these loadings exceed ten weight sections, the toughness of the substrate for lamp reflectors will fall and it will become weak.

[0015]What is necessary is just to polymerize monomers, such as the aminocaproic acid, lactam or diamine which forms polyamide resin, and dicarboxylic acid, under existence of the above-mentioned sheet silicate of the specified quantity, in using polyamide resin as matrix resin, for example, in order to obtain the thermoplastic resin composition in this invention. It can also obtain by carrying out melt kneading of the organic treating layer-like silicate produced by making insert the organic compound of the specified quantity between layers beforehand to this matrix resin.

[0016]In a thermoplastic resin composition, paints, a release agent, a thermostabilizer, an antioxidant, fire retardant, a plasticizer, etc. can be added in the range which does not spoil the characteristic greatly. The time of a polymerization or the obtained thermoplastic resin composition is added to these, melt kneading or when carrying out melt molding.

[0017]The thermoplastic resin composition of this invention can be fabricated in desired lamp reflector shape with thermofusion shaping of injection molding, extrusion molding, entrainment shaping, etc., and its method especially by injection molding is preferred.

[0018]

[Example]Next, an example explains this invention still more concretely. The raw material used for the example and the comparative example and the measuring method of each property value are as follows.

[0019]1. As opposed to talc ground so that mean particle diameter might be set to 4 micrometers with raw material (a) fluoride mica ball mill, Mean particle diameter mixes the \*\* sodium fluoride which is similarly 4 micrometers so that it may become 20% of the weight of the whole quantity, this is put into a porcelain crucible, and it is an electric furnace. It heat-treated at 800 \*\* for 1 hour, and fluoride mica was compounded. As a result of performing wide angle X diffraction measurement (the Rigaku make and RAD-rB type X-ray diffractometer are used) about the powder of refined fluoride mica, it is the thickness of c shaft orientations of raw material talc. The peak over 9.2 Å disappeared and the peak corresponding to 12-16 Å which shows generation of fluoride mica was accepted.

(b) The Kunimine Industries high grade montmorillonite "\*\*\*\*\*-I" which generated the natural montmorillonite from montmorillonite Yamagata by elutriation processing was used.

(c) Polyamide resin composition (PA-1)

To 10 kg of epsilon caprolactam, 1 kg of water and 400 g of fluoride mica (mean particle diameter: 4 micrometers) are added, this is put into autoclave with a content volume of 30 L, and it heats at 260 \*\*, and it was made to go up until internal pressure became 15 kg / cm<sup>2</sup>. They are a pressure of 15 kg / cm<sup>2</sup>, and temperature, emitting a steam gradually after that. After polymerizing for 2 hours, holding at 260 \*\*, pressure was discharged to ordinary pressure over 1 hour, and it polymerized for 40 more minutes. When the polymerization was completed, the above-mentioned resultant was paid out to strand shape and the pellet which cuts and consists of polyamide resin compositions after cooling and solidification was obtained. Subsequently, after 95 \*\* hot water performed scouring for 8 hours, vacuum drying of this pellet was carried out. The obtained polyamide resin compositions are silicate layers. It contained 4.4% of the weight, and relative viscosity was 2.5. When wide angle X diffraction measurement was performed about the pellet of this polyamide resin composition, it turned out that the peak of the thickness direction of fluoride mica has disappeared thoroughly, and fluoride mica is distributed with the molecular level in polyamide resin.

(d) Polyamide resin composition (PA-2)

About the fluoride mica 400g which is 4 micrometers, mean particle diameter is epsilon caprolactam beforehand. 16 g, 10 kg of water, and 85-% of the weight phosphoric acid aqueous solution It added into the solution which mixed and obtained 16.1 g, and the mixed liquor which stirs for 60 minutes under maintenance using a homogenizer at 80 \*\*, and contains the fluoride mica (henceforth "organically-ized mica") by which organic processing was carried out was obtained. These organically-ized mica was collected by repeating filtration/rinsing using a Buchner funnel, and it dried after that and it was ground. This organically-ized mica 400g After mixing with a nylon 6 resin (Unitika, Ltd. make, A1030BRL) pellet, A twin screw extruder (the Ikegai Corp. make, PCM-30 type) is used, and it is cylinder temperature. Melt kneading was carried out at 260 \*\*, and subsequently to strand shape it paid out, and after cooling and solidification, it cut and the pellet of the polyamide resin composition was obtained. Subsequently, after 95 \*\* hot water performed scouring for 8 hours, vacuum drying of this pellet was carried out. The obtained polyamide resin compositions are silicate layers. It contained 4.0% of the weight, and relative viscosity was 2.5. When wide angle X diffraction measurement was performed about the pellet of this polyamide resin composition, it turned out that the peak of the thickness direction of fluoride mica has disappeared thoroughly, and fluoride mica is distributed with the molecular level in polyamide resin.

(e) Polyamide resin composition (PA-3)

Mean particle diameter used the montmorillonite which is 1 micrometer, and also the pellet of the polyamide resin composition was obtained like the above (c). The obtained

polyamide resin compositions are silicate layers. It contained 4.3% of the weight, and relative viscosity was 2.5. When wide angle X diffraction measurement was performed about the pellet of this polyamide resin composition, it turned out that the peak of the thickness direction of montmorillonite has disappeared thoroughly and montmorillonite is distributed with the molecular level in polyamide resin.

(f) Glass fiber reinforced nylon 6 (PA6G)

The Unitika, Ltd. make, A1030GFL (g) minerals restoration nylon 6 (PA6I)

The Unitika, Ltd. make, A3130 [0020]2. Based on ASTM-D792, it measured with the underwater substitution method using the test piece for bend test of measuring method (A) specific gravity ASTM-D790.

(B) It measured based on rate ASTM-Dof bending flexibility 790.

(C) Based on load deflection temperature ASTM-D648, it measured by load 1.8MPa.

(D) The coefficient of linear expansion ( $10^{-5}/K$ ) of the flow direction of resin, and a flow and rectangular directions was measured using the square pillar 3 mm in width, and 12.7 mm in length cut down from the test piece for bend test of coefficient-of-linear-expansion ASTM-D790. The sample was heated to 25-220 \*\* in the heating furnace, and calculated the coefficient of linear expansion from change of the sample length between 30 - 200 \*\*.

[0021]About example 1 polyamide resin composition (PA-1), it is cylinder temperature. 260 \*\*, Injection molding is carried out using an injection molding machine (the Toshiba Machine make, IS-80G) under the die temperature of 70 \*\*, and the condition for ejection time 5 seconds, and it is thickness. A 3.2-mm specimen was created and specific gravity, rate of bending flexibility, load deflection temperature, and  $E_{TD}/E_{MD}$  was evaluated using this, respectively.

[0022]Instead of the example 2 polyamide resin composition (PA-1), PA-2 was used, and also the specimen was created like Example 1, and the examination was presented, respectively.

[0023]Instead of the example 3 polyamide resin composition (PA-1), PA-3 was used, and also the specimen was created like Example 1, and the examination was presented, respectively.

[0024]Used PA6G instead of the comparative example 1 polyamide resin composition (PA-1), and cool time at the time of shaping was made into 10 seconds, and also the specimen was created like Example 1, and the examination was presented, respectively.

[0025]Used PA6I instead of the comparative example 2 polyamide resin composition (PA-1), and cool time at the time of shaping was made into 10 seconds, and also the specimen was created like Example 1, and the examination was presented, respectively.

[0026]The result in Examples 1-3 and the comparative examples 1-2 is collectively shown in Table 1.

[0027]

[Table 1]

		実施例 1	実施例 2	実施例 3	比較例 1	比較例 2
成形原料	種類	PA-1	PA-2	PA-3	PA6G	PA6I
	強化材の種類	ガラス繊維	ガラス繊維	ガラス繊維	ガラス繊維	無繊維
	配合量 (重量%)	4.4	4.0	4.3	30	35
成形品の物性	比重	1.15	1.15	1.15	1.36	1.42
	曲げ弾性率 (MPa)	5530	5500	5250	6900	5800
	荷重たわみ温度 (°C: 1.8MPa)	157	154	146	198	167
	$E_{TD}/E_{MD}$ *	1.14	1.24	1.15	4.5	1.6

\* $E_{MD}$ は樹脂の流れ方向の縦断弾係数、 $E_{TD}$ は流れと直角方向の縦断弾係数をそれぞれ表す。

[0028]Each polyamide resin composition used in Examples 1-3 is excellent in a moldability, it is a light weight and high heat resistance, and it possesses high dimensional stability, and can use it suitably as a substrate for lamp reflectors. On the other hand, since there were many additions of reinforcement, each polyamide resin composition used in the comparative examples 1-2 is heavy, and in especially the

comparative example 1, it is inferior also to dimensional stability.

[0029]

[Effect of the Invention]According to this invention, it is lightweight and the substrate for lamp reflectors which is high heat resistance and consists of a thermoplastic resin composition with little anisotropy of the dimensional change at the time of heating can be obtained.

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